View of aerated lagoon

Perimeter of wetland cell

Effluent end of wetland cell

La Veta Facility Statistics	
Nearest Town:	La Veta
County:	Huerfano
River Basin:	Middle Arkansas
Receiving Water Body:	Cucharas
Year Online:	1993
Population:	850
Elevation (feet):	6910
Design Flow (mgd):	0.125
Average Flow (mgd):	0.075
Size (acres):	1.6

Facility Description

The Town of La Veta has a domestic, minor municipal lagoon wastewater treatment facility. The Town of La Veta's wastewater treatment facility utilizes a partially aerated lagoon system followed by a constructed wetlands system to treat influent wastewater. The Town's treatment facility utilizes the following treatment components and unit processes: influent flow measurement, lagoon system consisting of one mechanically aerated cell and two stabilization cells, wetland system consisting of two cells, chlorination, dechlorination using sulfur dioxide, effluent flow measurement and a continuous effluent flow measuring device.

Lagoons

The La Veta lagoon system consist of one aerated cell and two stabilization cells. The aerators are operated 24 hours a day, 7 days a week during the winter and 8 hours a day during the rest of the year. Some features of this lagoon system are detailed in the table below.

Lagoon Information			
Cell No.:	1	2	3
Surface Area (sq. ft.)	46,180	118,040	43,380
Avg. Depth (ft)	4.85	4.85	5.5
Avg. Volume (Million gallons)	1.554	3.972	1.674
Detention time (days)	17.5	44.8	18.9
Aerator size (hp)	3	NA	NA

Background Information

La Veta's original wastewater collection and treatment facilities were constructed in 1974 to provide central sewage treatment to residents of the service area. The 1992 expansion and modification of the original treatment facility was brought about as a result of the original treatment facility being overloaded, its inability to produce an effluent which could consistently comply with the facility's discharge permit limitations and the need to provide additional treatment capacity to accommodate projected growth in the service area.

Energy Analysis

The wastewater flows through the system by gravity. Energy is consumed in the aerated lagoons by submersible 3hp pumps. During the winter months these pumps run 24 hours a day. The rest of the year, the pumps are operated 8 hours, during the night. A typical energy bill is about $450 a month.

Construction Costs

This wetland system cost approximately $365,000 to construct. Since it was established in an abandoned lagoon, earthwork was minimized.

Wetland Design

Design Methods

The design of the wetland system is based on BOD5 removal using the first order, plug flow, reaction kinetics model developed by Reed, Middlebrooks and Crites. It is assumed that the bulk of settleable solids will be removed in the lagoon system, therefore; influent BOD5 will be primarily soluble BOD and floatable or suspended algal material. A water balance was done to determine the typical wetland hydraulic loading rate. The required water depth for a hydraulic residence time of 11.9 days in the winter and 5 days in the summer will be an operating depth of 6" to 12", with the maximum depth kept to less than 24".

Objectives

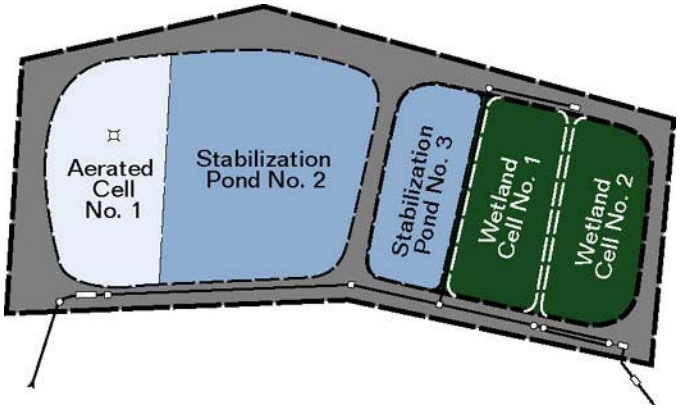
The main objective of the wetland cells is to remove TSS due to algal carryover from the lagoons.

Size

The wetland system is a surface flow system consisting of two cells. The total area of the wetland system is 69,400 square feet (1.6 acres).

Shape

As shown by the schematic, the sedimentation forebay is rectangular and the wetland cells are rectangular with a direct flow path. The wetland cells are constructed within the embankments of an abandoned lagoon.



Hydraulics

Each wetland cell is equipped with its own influent and effluent flow system. A timber wall equipped with a longitudinal weir plant at its top, runs along the width of each wetland. This structure provides uniform flow into the wetlands. Both wetland cells can be bypassed, or one cell can be taken offline for maintenance. The water flow to each wetland is controlled by adjustment of the weir plates installed in the influent control structure. Flow depth in the wetland cells can be adjusted by installing stop planks at the effluent end of each cell. During normal summer months, the depth in the cells operates in the range of 6 to 12 inches. During the winter, the flow is maintained 4 to 6 inches under the ice cover. The effluent end of each wetland cell consists of timber walls with semi-circular corrugated metal pipe fitted in open sections. Outlet pipes are located outside the timber walls. Each outlet pipe is equipped with a perforated cap and buried in river rock.

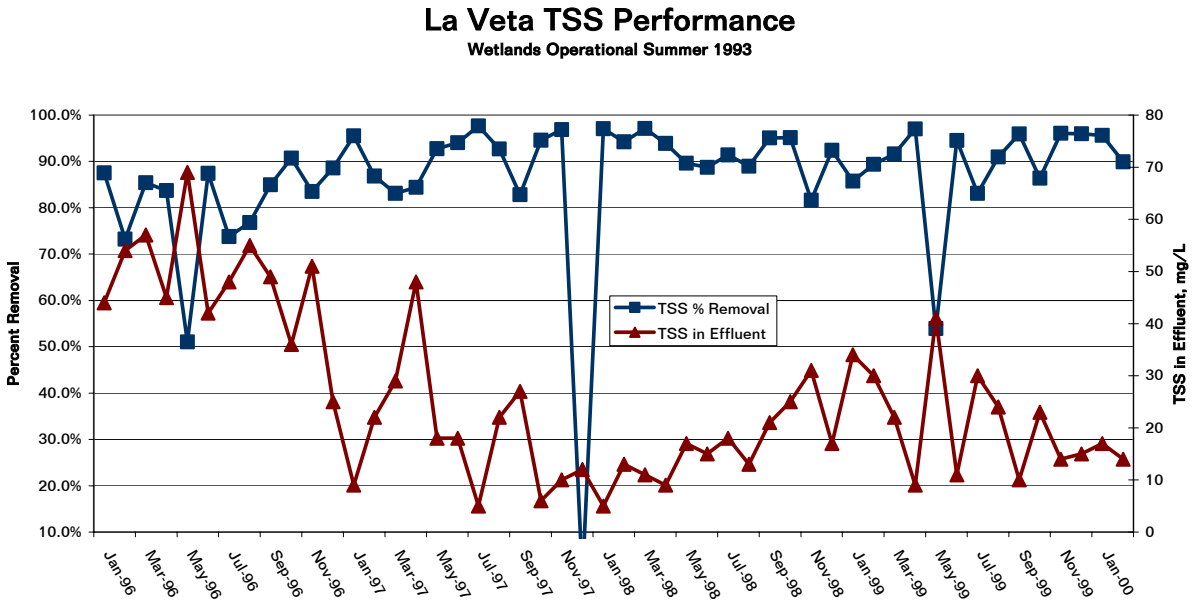
Treatment Goals

Permitted Discharge Limitations	
Oil and Grease:	10 mg/l (Daily Max)
BOD_5:	30 mg/l (30-day ave)
BOD_5 Removal:	85%
TSS:	75 mg/l (30-day ave)
PH, su (min – max)	6.5 – 11.5 (Daily Max)
Total Chlorine Residual	0.048 (Daily Max)
Total Ammonia (as N), mg/l	5.2 – 68 (varies seasonally, based upon the allowable instream total ammonia concentrations.)
Fecal Coliform Bacteria:	6,000 organisms per 100 ml (Daily Max)

Water Quality Data

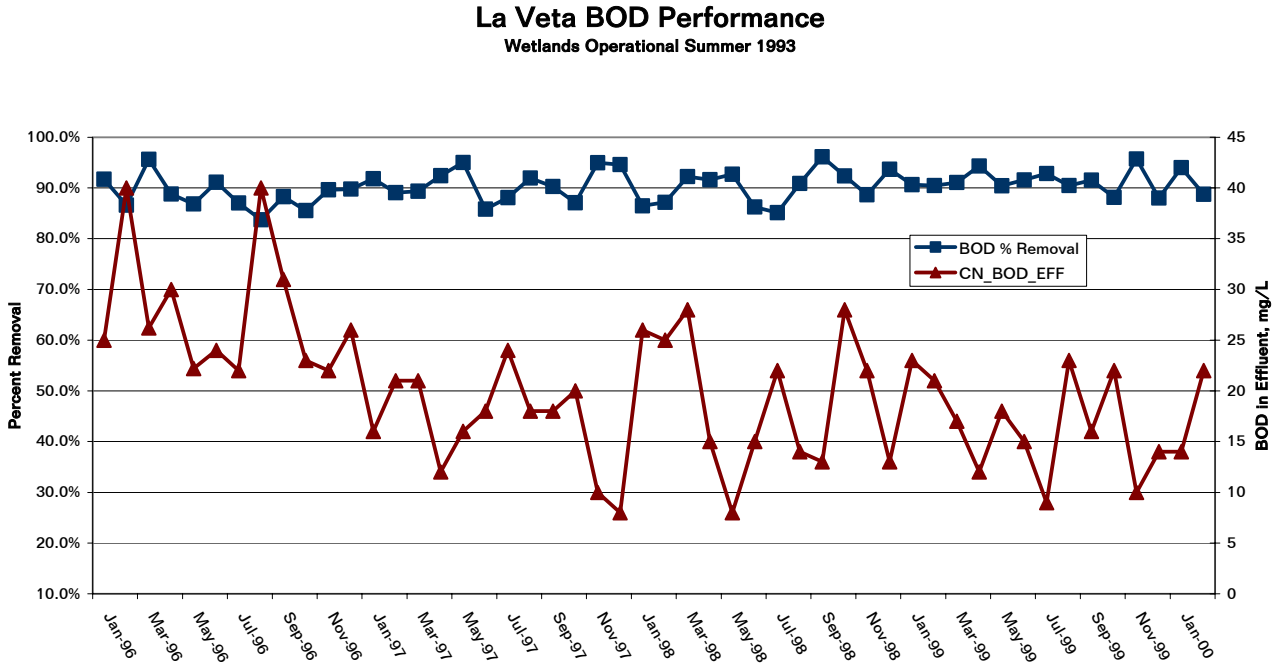
TSS Data

The TSS graph plots the percent removal on the left axis and TSS in mg/l in the effluent on the right axis. The average monthly TSS in the influent, since 1996, has been 245 mg/l and the average monthly effluent has been 26 mg/l. This meets the permit discharge requirement of 75 mg/l.



BOD Data

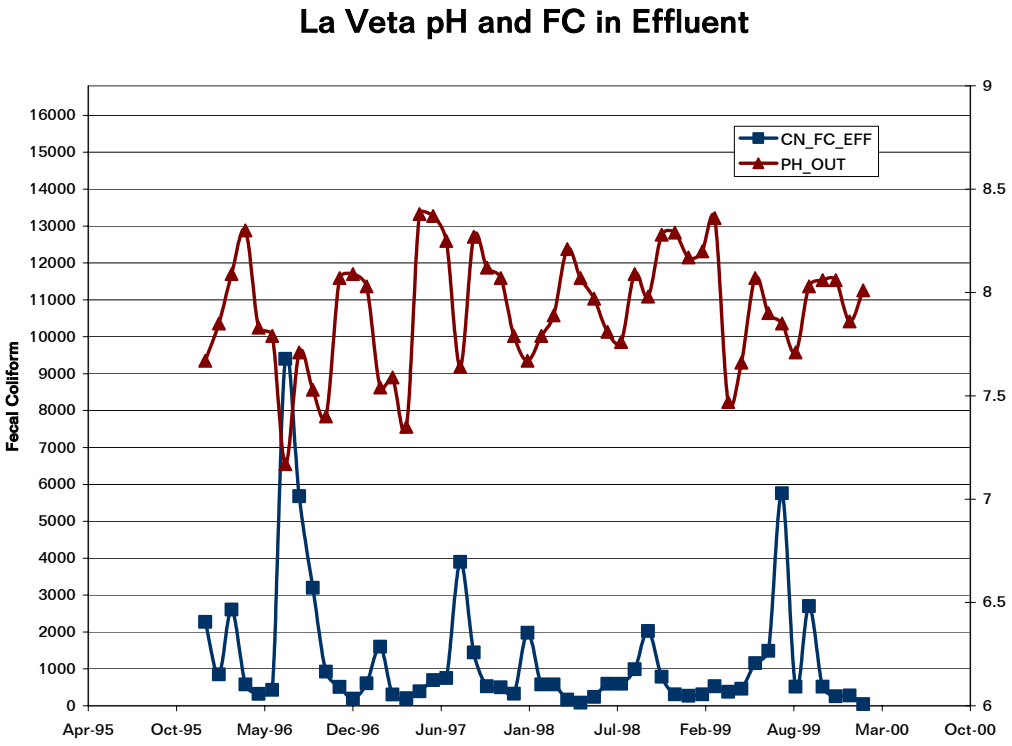
The BOD data is plotted similarly to the TSS data, with mg/l in the effluent on the right axis, and percent removal on the left axis. The average monthly influent amount has been 217 mg/l and the average monthly effluent amount has been 20 mg/l.



pH and Fecal Coliform

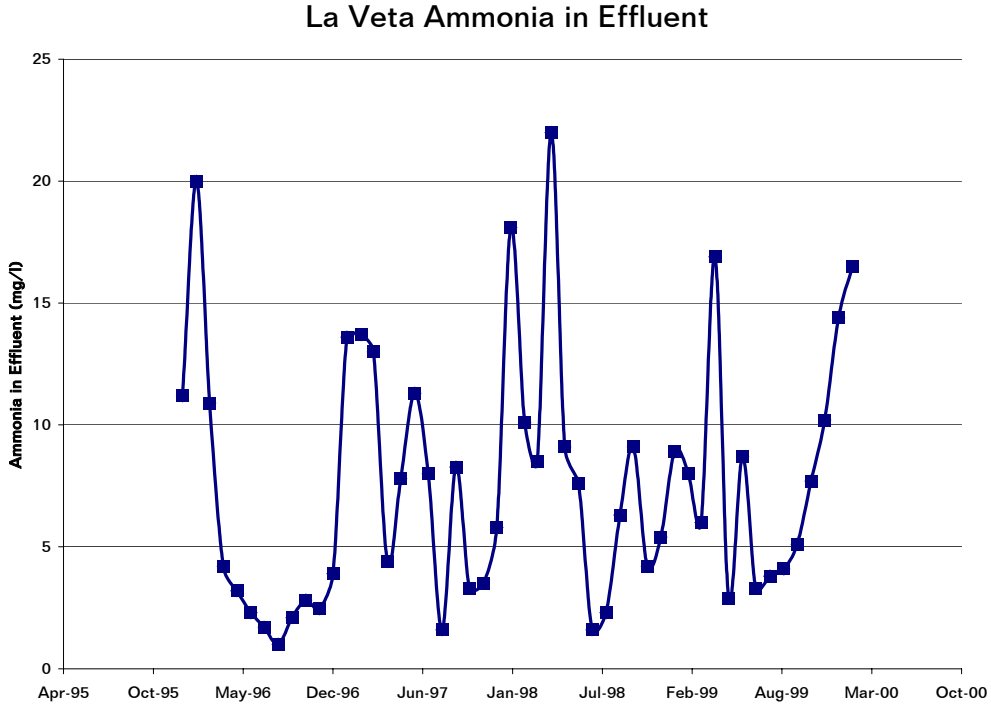
Data for these two categories has been plotted on the same graph. Data reflect the quality of the effluent, not influent measurements are taken for these parameters. The pH values plotted are an average of the minimum and maximum 30-day values that are reported in the monthly reports. Previous to the wetland implementation, data indicate that average pH values in the effluent were close to the maximum daily allowable of 11. An amendment to the discharge permit changed the maximum pH limitation from 9.0su to 11.0 s.u. La Veta was eligible for this amendment because it met both applicable requirements, 1) no inorganic chemical could be added to the wastestream, and 2) contributions from industrial sources do not cause the pH of the effluent to be less than 6.0 s.u. or greater than 9.0 s.u. It was determined that the high pH in the system was due to significant algae bloom in the lagoons.

A chlorination-dechlorination system is provided as a part of the treatment to meet the fecal coliform permit limitations. This system has not been used in the last 5 years because effluent quality has been suitable for discharge without their use.



Ammonia

The discharge permit for the wastewater treatment facility required a two-year ammonia monitoring program. All data gathered during this monitoring program was submitted to the Water Quality Control Division to establish ammonia discharge parameters. The average monthly ammonia in the effluent has been 7.6 mg/l.



General Ecological Setting

The two LaVeta constructed wetland cells are flat and rectangular. The wetland discharges to the Cuchares River. The LaVeta treatment wetlands are located in the broad valley of the Cucharas River, at the base of a piñon pine-dominated bluff.

Cell Vegetation

Two cells are present at the LaVeta site. Cell 1 is composed of 80 percent water, 10 percent litter, and 10 percent vegetation. The vegetation communities for cells 1 and 2 are identical. Community 1, which composes 90 percent of each wetland cell, is dominated by cattail (*Typha latifolia*), with *Scirpus americanus* and duckweed (*Lemna minor*) present but not dominant. Vegetation community 2, which composes the remaining 10 percent, is dominated by cattail, softstem bulrush (*Scirpus tabernamontanae*) with duckweed, willowherb (*Epilobeum ciliata*), creeping spikerush (*Eleocharis palustris*), foxtail barley (*Hordeum jubatum*)and sandbar willow (*Salix exigua*) present but not dominant. The site is dominated by 95 percent water and 5 percent vegetation.

Planting/Seeding

Cattails were planted at the site in the fall. The planting rate is not known..

Weeds

Canada thistle (*Cirsium arvense*), mullein (*Verbascum thapsus*), and gumweed (*Grindelia squarosa*) are present around ponds and wetlands in both cells. Canada thistle and mullein are on the State Noxious Weed list. They are invasive in areas of recent disturbance, and spread quickly. They also prevent the establishment of native species and have low wildlife value.

Maintenance Issues

No maintenance items were noted.

Wildlife

The LaVeta wetland provides habitat for muskrat, beaver, red winged black birds, waterfowl, and geese. Mallards and herons were observed during the site visit. This wetland has structural diversity in the form of small patches of open water interspersed with cattail stands. From a landscape perspective, it provides valuable wildlife habitat. There are no other similar wetland/open water complexes in the area, and the treatment facility gains extra value because of its location between the Cucharas River floodplain and the piñon bluff.

Wetland Biodiversity Functional Assessment

Sediment/nutrient/toxicant removal and production export/food chain support both rated high. General wildlife habitat rated moderate. Habitat diversity and uniqueness of the constructed wetland rated moderate to low. This wetland received 45 percent of the total possible functional points. It rated as a category III wetland.

Wetland Biodiversity Functional Assessment.		
Function and Value Variables	Functional Points (0.1 to 1)	Possible Points
General Wildlife Habitat	0.5 (mod.)	1
General Fish/Aquatic Habitat	0.0	1
Production Export/Food Chain Support	0.2 (low)	1
Habitat Diversity	0.2 (low)	1
Uniqueness	0.2 (low)	1
Total Points	2.7 (54%)	5
Wetland Category (I, II, III, or IV)	III	

Human Use

The wastewater wetland is part of a restricted public access area. A local student studied the wetland system and participated in a science fair. This wetland has high aesthetic value because it is well vegetated and located in a visually interesting area.

Overall Site Comments

This wetland functions well in treating wastewater and it has high biological and aesthetic value.